REMARKS

Claims 1-3, 6-24 and 26-29 are pending in this application. Claims 11-22 are withdrawn from consideration. By this Amendment, the specification is amended to correct several terms that were mistranslated from the original Japanese priority application and to supply data inadvertently deleted from Table 1. Support for the amendments to the specification can be found in the accurate translation of the priority document JP 2004-113469 attached herewith. Additionally, by this amendment claims 1, 7, 8, 10, 24, and 26-29 are amended for improved clarity and claims 4, 5 and 25 are canceled. No new matter is added.

The courtesies extended to Applicants' representative by Examiner Cole at the interview held February 23, 2009, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

Applicants submit an Information Disclosure Statement (IDS) concurrently with this filing. It is respectfully requested that the Examiner consider the submitted references and initial the attached PTO 1449 form.

I. §112 Rejection

The Office Action rejects claims 5 and 25 under 35 U.S.C. §112, second paragraph, for allegedly being indefinite. Claims 5 and 25 have been canceled. Thus, this rejection is moot.

II. Traversal of the §103 Rejections

The Office Action rejects claims 1-10 and 23-29 under 35 U.S.C. §103(a) over WO 03/06002 to Kim in view of U.S. Patent No. 5,844,523 to Brennan et al. ("Brennan"). The Office Action also rejects claims 1-10 and 23-29 under 35 U.S.C. §103(a) over U.S. Patent No. 6,203,814 to Fisher in view of Brennan. This rejection is respectfully traversed.

A. Preliminary Matter Regarding Rejection over Fisher and Brennan

As discussed during the February 23 interview, the current Office Action maintains that dispersion (of the carbon nanofibers) is a result effective variable. However, this assertion is contradicted by case law. The Office Action states that "Fisher teach[es] that dispersion of the fibrils is a result effective variable [which] is related to the surface properties of the modified fibers and/or the compatibility of the matrix polymer with the functional groups." See page 4, line 21 to page 5, line 2 of Office Action. The MPEP 2144.05(II)(B) states that "a particular parameter must first be recognized as a result-effective variable, i.e. a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation" (emphasis added). As such, the rejection over Fisher lacks merit.

As discussed in the interview, dispersion is the recognized result not the variable. The Examiner is asserting that it would be obvious to optimize the choice of surface properties or the compatibility to affect dispersion. As such, the surface properties of the fibrils (the alleged carbon nanofibers) and/or the compatibility of the matrix polymer with the functional groups are the "variables" being modified. Therefore, dispersion cannot qualify as a result effective variable.

Applicants thank the Examiner for clarifying her rejection in the interview summary. Applicants further request that the Examiner formally withdraw the previous rejection. Applicants also respectfully request that if the Examiner chooses to reject the claims again over Fisher and Brennen, that she articulate the legal and technical reasons allegedly supporting her conclusion with as much detail as possible so that Applicants have as full a record for Appeal as possible.

B. The Applied References Do Not Inherently Disclose a Material Having the Recited Spin-Spin Relaxation Times

Claim 1 recites that "the composite material has a first spin-spin relaxation time (T2n) of 100 to 3,000 μsec and a second spin-spin relaxation time (T2nn) of being absent or 1,000 to 10,000 μsec." Claim 1 further recites that "a fraction (fnn) of components [have] the second spin-spin relaxation time of less than 0.2." Claims 7 recites similar features. The Office Action concedes that the applied references do not explicitly disclose these spin-spin relaxation times. Rather, the Office Action asserts that this feature is inherent to the applied references.

Specifically, the Office Action asserts that because Fisher and/or Kim both disclose "the same materials are employed and the same results are obtained, it is reasonable to presume that the materials of [Kim/Fisher] would have the claimed spin-spin relaxation time." As discussed at length below, Applicants dispute that the same results are obtained. But even if the same results are obtained, the recited spin-spin relaxation time is not an inherent feature of the final product that would be produced by the process of either Kim or Fisher.

To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present and that it would be so recognized by person of ordinary skill. *In re Robertson*, 169 F.3d 743 (Fed. Cir. 1999). Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient to support an inherency rejection. In this case, spin-spin relaxation time can depend on several factors that vary in the applied references.

Both Fisher and Kim allegedly reinforce rubber by adding carbon nanotubes and dispersing them into the rubber. The Office Action asserts that the same raw materials are used (i.e. rubber and nanotubes), and a material with the same desired effect is produced

(stronger rubber). As such, the Office Action asserts that the final product must have the recited spin-spin relaxation time.

However, by analogy consider the formation of steel, and steel alloys. The same raw materials are used (i.e. iron, carbon, various alloying metals) and the same general type of final product is produced (i.e. steel). Yet not all steels have the same properties. In fact, steels with radically different properties are produced based on, for example, the specific methodology, temperature, and casting techniques used in manufacture.

So to reinforced rubber can have different properties based on how the reinforced rubber is manufactured. As evidence, Applicants submit the attached Declaration of Mr. Toru Noguchi. Mr. Noguchi conducted a series of tests. The purpose of the tests was to examine the effect that the method of mixing the components had on the final composite product. In these tests the same raw materials were used. Specifically, in the experiments EPDM 100 parts by weight (phr) was used as the primary elastomer. Carbon nanofibers with an average diameter of 13nm in the amount of 10 phr and peroxide (DCP) 2 phr were used as crosslinking agents.

Each identical set of materials was mixed using one of three different mixing methods (methods A-C). Mixing method A was a shear rolling method as described in Applicants' specification. Mixing method B was a general mixing method using a Labo Plastmill (Banbury mixer style). Mixing method C used a twin screw extruder, shown in attached Fig. 3. The results of the tests are shown in Table 1.

Table 1 shows that Method A resulted in a first spin-spin relaxation time of 1860 μs and a second spin-spin relaxation time of 6100 μs. These values lie in the ranges defined in claim 1. By contrast, Table 1 shows that Method B resulted in a first spin-spin relaxation time of 3200 μs and a second spin-spin relaxation time of 12000 μs. Method C resulted in a

first spin-spin relaxation time of 3900 μs and a second spin-spin relaxation time of 17000 μs. The values achieved using Methods B and C lie outside the ranges defined in claim 1.

More importantly, the spin-spin relaxation times varied based on mixing method. In other words, spin-spin relaxation time is not an inherent property of raw material and final product, as alleged by the Office Action. Rather, spin-spin relaxation time varies based on other factors, including mixing method.

In WO 90/10296 to Yonekawa (previously cited in the February 1, 2006 Office Action), the reference discloses that the rubber and fibrils (the alleged nanofibers) can be mixed using different methods, such as mixing, kneading, rolling and extruding. See Yonekawa, page 20. Yonekawa describes the final product of each of these mixing methods as reinforced rubber. Thus, under the Office Action's logic, if the treated fibrils of Fisher were mixed with natural rubber, the same "product" is produced as if the treated fibrils were kneaded with natural rubber. Yet the spin-spin relaxation time of each would be different. Neither Fisher nor Kim specify a mixing method used when a composite material would be manufactured. Thus, the recited spin-spin relaxation times would not necessarily occur during the course of production of the reinforced rubber of the applied references, as required by inherency case law.

C. There is No Disclosure in the Applied References That the Recited Spin-Spin Relaxation Time is a Desired Property of the Final Product

The applied references also do not disclose that it is desirable to produce a material having the recited spin-spin relaxation time.

Applicants' specification explains that spin-spin relaxation time is a property that can vary in a given elastomer, both before and after the introduction of the carbon nanofibers. For example, on page 7, lines 5-12, the specification notes that elastomers can have different spin-

spin relaxation times. The specification explains that spin-spin relaxation time is a measure of the molecular mobility of the rubber.

The specification further explains that the dispersion of the carbon nanofiber into the elastomer further restrains the spin-spin relaxation times. See Specification, page 18, lines 4-15. In other words, dispersion of the carbon nanofibers affects the spin-spin relaxation time. The more uniform the dispersion of the carbon nanofibers, the lower the spin-spin relaxation time becomes. Thus, Applicants' specification explains that spin-spin relaxation time can be used as a measure of the effectiveness of the dispersion.

By contrast, the applied references do not disclose or render obvious this relationship. Indeed, the applied references do not even discuss the existence of spin-spin relaxation time. Nor do the applied references disclose that variations in spin-spin relaxation time can be used to measure the effectiveness of carbon nanofiber dispersion. As such, Applicants respectfully submit that the applied references do not disclose or render obvious the recited spin-spin relaxation times.

D. Fisher Does Not Disclose or Suggest Substantially Uniform Dispersion

In the interview summary of the February 23 interview, the Examiner clarified the rejection over Fisher. Fisher allegedly discloses functionalized fibrils that are "easier to disperse." The interview summary asserts that Fisher "provides a teaching to one of ordinary skill as to how to improve dispersion of the fibril." The interview summary appears therefore to conclude that it would have been obvious to continue down the roadmap provided by Fisher to achieve substantially uniform dispersion.

However, this assertion is contradicted by the published art in the field since Fisher. Applicants draw the Examiner's attention to Liliane Bokobza's article entitled Mutliwall carbon nanotube elastomeric composites: A review (submitted in the IDS being concurrently filed with this Amendment) (hereinafter "Bokobza"). Bokobza was published in 2007,

several years after the disclosures of Fisher and Kim. Bokobza explains the fundamental problem inherent to dispersion of carbon nanotubes. Specifically, Bokobza explains that it is difficult "to obtain a homogeneous dispersion of carbon nanotubes in a polymer matrix because van der Waals interactions between individual tubes lead to significant aggregation or agglomeration." See Bokobza, page 4908, col. 2.

Bokobza also explains that numerous attempts to optimize dispersion have been attempted. Bokobza specifically identifies that "chemical functionalization" was one of the attempted methods. See Bokobza, page 4908, col. 2. This is the same method allegedly disclosed by Fisher. Bokobza states that the chemical functionalization approach was successful in epoxy matrices. See Bokobza, page 4909, col. 1. Yet Bokobza states that poor dispersion continues to "limit the full utilization of carbon nanotubes for reinforcing polymeric media." (emphasis added). In other words, Bokobza discloses that chemical functionalization has not yet yielded uniform dispersion in elastomers, such as natural rubber.

As such, Applicants respectfully submit that Bokobza conclusively rebuts the Office Action and interview summary. Those of ordinary skill in the art, at the time of Applicants' invention, did not believe that the method of Fisher could achieve substantially uniform dispersion of carbon nanofibers.

E. Kim Does Not Disclose or Render Obvious Substantially Uniform Dispersion

The Office Action asserts that Kim discloses uniform dispersion of carbon nanotubes in natural rubber. The Office Action bases this assertion on page 5, lines 13-30 of Kim. However, Kim only discloses methods that allow for more uniform dispersion of the carbon nanotubes. Kim does not disclose substantially uniform dispersion.

For example, page 5, line 13 of Kim refers to "improvement for more uniformly distributing carbon nanotubes." (emphasis added). Likewise, line 19 refers to more uniform

distribution and lines 21-22 state that the surfactants "helped to improve uniform distribution." (emphasis added).

The only statement in Kim that does not contain such a qualifier is found in lines 27-28, which state "the surfactants...are not limited in type as long as they distribute carbon nanotubes or GNF uniformly in the rubber." But Kim provides no disclosure or enablement of such uniform dispersion. Further, the focus of Kim does not appear to be on the uniformity of the dispersion. Also, as explained above, Bokobza states that those in the art had not been able to achieve uniform dispersion of carbon nanotubes in rubber.

Rather, Applicants submit that Kim only provides the same disclosure found in Fisher. Specifically, Kim merely discloses that surfactants improve distribution, but do not result in substantially uniform dispersion. Thus, for the same reasons as presented above, Kim fails to disclose substantially uniform dispersion.

For at least the above reasons, the applied references fail to disclose or suggest the features of independent claim 1, 7, 8 and 27. Thus, withdrawal of the rejection of claims 1, 7, 8 and 27, and claims 2, 3, 9, 10, 23, 24, and 26-29 depending therefrom, is respectfully requested.

III. The Alleged Deficiencies in the Declaration: Did Those in Art Solve the Problem

The Office Action asserts that the Declaration submitted with the August 25, 2008 Amendment was deficient for at least the reason that it failed to demonstrate that those "persons skilled in the art who were presumably working on the problem knew of the teachings of the above cited references, they would still be unable to solve the problem." Applicants would like to request clarification of the scope of this requirement, as interpreted by the Examiner, as explained below. Applicants also would like to dispute the currently understood scope of the Examiner's requirement.

A. Background

In order to demonstrate that a product fulfills a long felt, but unmet need, Applicant must demonstrate the following (in no particular order). First, that those of ordinary skill in the art recognized a problem and desired to solve this problem. In this case, the Office Action appears to be satisfied that Applicants have demonstrate that it was desirous to obtain uniform nanofiber dispersion. Second, Applicants must demonstrate those of ordinary skill were working on the problem for a significant period of time. The Office Action asserts that the Declaration does not provide this evidence. Third, the claimed invention must solve the identified problem. The Office Action does not dispute this factor. Finally, Applicants must demonstrate that those working in the applied art did not solve the problem first. See MPEP §716.04.

B. Clarification of the Requirement

The Office Action, as noted above, states the that Declaration failed to demonstrate that those "persons skilled in the art who were presumably working on the problem knew of the teachings of the above cited references, they would still be unable to solve the problem."

First, Applicants would like the following clarified. Does the Office Action wish Applicants to demonstrate that during the hypothetical time the persons of ordinary skill working on the problem were aware of the applied references? Or does the Office Action wish Applicants to demonstrate that if these persons had been made aware of the applied references, they still would not have been able to solve the problem?

Second, Applicants respectfully submit that the above requirement is not recited in §716.04 of the MPEP. Rather, this requirement is articulated in form paragraph 7.66.04, which interprets §716.04. However, Applicants do not believe that §716.04 contains the requirement quoted above.

C. Response to Alleged Deficiency of Declaration

Applicants are currently operating under the assumption that the Office Action wishes Applicants to demonstrate that if these persons had been made aware of the applied references they still would not have been able to solve the problem (second interpretation).[1] Applicants respond to this assertion as follows.

First, the relevant section of the MPEP does not make the requirement interpreted by the Office Action. MPEP §716.04 only states those of ordinary skill must not have previously solved the problem, by whatever means. Section 716.04 makes no reference to a requirement that those of ordinary skill in the art be aware of or specifically supplied with the cited references. The requirement cited by the Office Action does not appear in §716.04.

Rather, those of ordinary skill in the art are presumed to be aware of all relevant art. If they are unable to solve the problem it is presumed that either (1) the applied references are of no help or (2) the references are not truly analogous art because the experts in the field do not feel them to be relevant.

To the extent that stock paragraph 7.66.04 contradicts or adds to the requirements of §706.04, it is noted that the text of the relevant MPEP section is controlling over any stock paragraph interpretation. If there is case law supporting stock paragraph 7.66.04's interpretation of §706.04, Applicants respectfully request that the Examiner provide such citations.

Rather, MPEP §716.04 could only be interpreted to require that Applicants demonstrate that those working in the applied art did not solve the problem first. In this case, this would require Applicants demonstrating that those of ordinary skill could not use the applied references to solve the problem in some other manner than the claimed invention.

[1] Applicants base this assumption on the grounds that requiring an Applicant to prove what others in the art were aware of, in the past, is an unreasonable demand.

However, in the instant case, the problem to be solved involved creation of a material that had substantially uniform dispersion of carbon nanofibers in an elastomer. This is a binary problem. Either uniform dispersion is achieved or it is not. Thus, in this case requiring the Applicants to prove that those of ordinary skill could not solve the problem would be tantamount to requiring that Applicants prove the claimed invention is non-obvious over the applied references. Such a burden of proof is beyond the requirements of §716.04.

Applicants provided evidence in the Declaration stating that those of ordinary skill in the art did not believe uniform dispersion had been accomplished prior to the instant disclosure. The experts working on the problem, who lauded the inventors following their achievements, are recognized experts in their field. For example, Prof. Morinobu Endo praised the novelty of the claimed invention. Experts, such as Prof. Endo, are presumed to have been aware of the relevant art in the field. By extension, Prof. Endo is presumed to have been aware of the references cited by the Office Action. Thus, no further showing that Prof. Endo, or any other expert in the field, was specifically aware of the cited references should be necessary.

Applicants respectfully submit that any assertion that the Declaration must contain evidence showing that those of ordinary skill in the art were specifically aware of the applied references, or prove that they could not have solved the problem if they had known of the references, is contrary to the text of §716.04.

However, Applicants also submit that the Bokobza article demonstrates that those of ordinary skill in the art were aware of the methods disclosed by Fisher and Kim. As explained above, Bokobza indicates that functionalization of carbon nanotubes had not yet resulted in uniform dispersion as of 2007. Thus, Applicants submit that Bokobza cures this alleged defect in the August 25, 2008 Declaration.

It is respectfully submitted that the reaction of these experts to the success of the inventors, and the text of Ms. Bokobza's article, is sufficient evidence that those prior to the Applicants had been unsuccessful in solving the problem.

IV. Further Evidence that the Claimed Invention Met a Long Felt Need

The Office Action also asserts that the August 25 Declaration failed to demonstrate that those of ordinary skill in the art were working to solve the problem for a substantial length of time. Applicants respectfully submit the applied references themselves provide this evidence. Fisher discloses that its inventors desired to achieve more uniform dispersion of carbon nanotubes as early as 1994 (the filing date of Fisher). Kim demonstrates that those in the art were still attempting to solve the problem in 2003. Applicants priority date is April 9, 2003. Thus, from 1994 to 2003, those in the art were attempting to achieve more uniform dispersion of carbon nanofibers in rubber and similar elastomers.

For at least the above reasons, Applicants again respectfully submit the claimed invention fulfilled a long felt but unmet need in the art.

V. Withdrawn Claims

In accordance with MPEP 821.04, if product claims are elected and subsequently allowed, rejoinder of non-elected process claims that depend from or otherwise include all of the limitations of allowed product claims is permitted. Withdrawn claim 11 includes all the features of claim 1. Thus, upon allowance of claim 1, rejoinder of claim 11 as well as claims 12-22 dependent therefrom is requested.

VI. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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JAO:MKW/jfb

Attachments:
Petition for Extension of Time
Declaration of Toru Noguchi
Accurate Translation of JP 2004-113469 (with translator's verification)
Replacement Table 1

Date: May 11, 2009

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